

THE EFFECT OF EXERCISE ON THE REGIONAL DISTRIBUTION
OF INHALED PARTICLES

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We have investigated the deposition of an inhaled radioaerosol during exercise to determine if the increased ventilation of exercise has an important influence on the regional distribution of inhaled particles. Eight healthy volunteers and five normal cigarette smokers inhaled a submicron aerosol of ^{99m}Tc sulphur colloid whilst sitting quietly at rest and again during exercise sufficient to produce a predicted oxygen uptake of 2 liters/min. Tracheobronchial and alveolar deposition were distinguished by performing aerosol imaging immediately and again 24 hours after each study, by which time particles deposited in the conducting airways had been cleared by mucociliary action. Regional changes were studied by dividing the right lung into three concentric zones: central, intermediate and peripheral, and three vertical zones: upper, middle and lower.

The increase in total particle deposition on exercise was similar to the increase in minute ventilation in both smokers and nonsmokers. There was a gradient in alveolar ventilation in the upright position at rest which increased from apex to base and largely disappeared on exercise. Alveolar ventilation in the upper zones on exercise was significantly less in smokers compared to nonsmokers. The proportion of particles depositing in the tracheobronchial region increased on exercise, particularly in smokers, with greatest deposition in the upper zones. The relative increase in particle deposition which occurs in the upper zones on exercise and the difference between smokers and nonsmokers may be important in the pathogenesis of occupationally related dust-induced lung disease.

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